PROJECT:	Portland Harbor FS	COMPUTED BY :	ARB
JOB NO.:	79171.3383.345.FSZ	DATE :	8/11/2015
CLIENT:	EPA	CHECKED BY:	JN
		WRKSHT NO. :	QTY-05

GIS Riverbank Estimate Assumptions (7/20/2015)

1. Contaminated riverbanks are pre-determined areas defined as lines along the outer limits of the site boundary and are estimated locations only.
2. Riverbank technology assignment was assumed to be the same as the nearshore technology assignment.
   a. A parallel line 20 ft interior of the riverbank lines was used to estimate technology assignments
   b. The parallel line was intersected with the technology assignments at each alternative B through G.
3. Based on this intersection some rough linear estimates were given in the following table.

	Length of Riverbank by Tech Assignment (FT)				
Technology Name	**Alt. B**	**Alt. D**	**Alt. E**	**Alt. F**	**Alt. G**
Cap with armoring (3ft)		40	40	97	486
Reactive armored cap (3ft)	687	852	894	1,230	1,278
Dredge with backfill		1,159	1,159	1,376	2,496
Dredge with engineered cap (3ft)				454	951
Dredge with reactive armored cap (3ft)	1,832	2,202	3,278	4,773	4,893
Dredge with reactive cap (3ft)	496	667	869	1,587	2,278
Dredge with residual layer (1ft)				239	239
Dredge with reactive residual layer (1ft)	913	1,228	1,835	2,302	2,304
Dredge with reactive residual layer (1ft)	5,010	6,281	7,083	6,687	6,886
Dredge with significantly augmented reactive cap (3ft)	687	770	889	889	889
EMNR in Swan Island	1,742	1,259	921	780	83
Monitored Natural Recovery	14,465	11,374	8,862	5,418	3,049
Previously remediated	309	310	310	310	310
Grand Total	**26,141**	**26,141**	**26,141**	**26,141**	**26,141**

Note: No action will be taken for the areas designated EMNR/MNR because it is not considered to be in an SMA

PTW Estimate Assumptions (7/20/2015)

1. The parallel riverbank lines from above were intersected with each of the three types of PTW.
2. Not reliably contained PTW was not found within 20 ft of the riverbank areas and no values were obtained. The others are shown in the table below.
3. NAPL is the only PTW assumed to be treated and the only one used for calculations

	Length of Riverbank Identified as PTW Dredged (FT)				
PTW -- Highly Toxic	6,597	8,663	11,233	12,056	12,056
PTW -- NAPL	1,684	1,687	1,688	1,688	1,688
PTW -- Not Reliably Contained	-	-	-	-	-
PTW -- Total Dredged*	**8,280**	**10,350**	**12,921**	**13,744**	**13,745**

*This value is not a sum but the two types of PTW do not overlap at the riverbank

Riverbank Volumes for Dredge-Disposal

Note: The 5:1 slope was identified in the draft FS as an ideal condition; however, bank conditions are variable due to nearshore obstructions. For cost estimating purposes, bank volumes and areas are based on linear feet and the simplified assumptions listed below.

Assumed Bank Slope =	1 V	3 H
Assumed Bank Height, ft =	15	
Horizontal (plan) distance, ft =	45	
Hypotenuse length, ft =	47.4	
Average depth, ft =	3	
Common Earth Conversion from BCY to LCY:	1.12	*Means Heavy Construction Handbook*

= Assumed Bank Height x Assumed Bank Slope H ÷ Assumed Bank Slope V

=(Assumed Bank Height ^{2} + Horizontal (plan) distance ^{2})$^{1/2}$

= Riverbank to be Excavated x Average Depth x Hypotenuse Length ÷ 27

CDM Smith

PROJECT:	Portland Harbor FS	COMPUTED BY :	ARB
JOB NO.:	79171.3383.345.FSZ	DATE :	8/11/2015
CLIENT:	EPA	CHECKED BY:	JN
		WRKSHT NO. :	QTY-05

Riverbank Volumes for Dredge-Disposal

= Length of Riverbank by Tech Assignment x Hypotenuse length ÷ 43560

Riverbank to be Excavated (LF)	8,938	12,306	15,113	18,306	20,935
Volume Excavated (BCY)	47,105	64,860	79,653	96,481	110,340
Excavated Volume for Riverbanks (LCY):	**52,758**	**72,643**	**89,212**	**108,059**	**123,581**
PTW-NAPL to be Excavated (LF)	1,684	1,687	1,688	1,688	1,688
Volume Excavated (BCY)	8,874	8,891	8,898	8,898	8,898
Riverbank Volume for Subtitle C Disposal (LCY):	**9,939**	**9,958**	**9,966**	**9,966**	**9,966**
Riverbank Volume for Subtitle D or CDF Disposal, CY:	**42,819**	**62,685**	**79,246**	**98,093**	**113,615**

Riverbank Areas for Capping (AC)

= Respective Riverbank Area for Cap by Tech Assignment x Cap Component Thickness x 43560 ÷ 27

Technology Name	Alt. B	Alt. D	Alt. E	Alt. F	Alt. G
Cap with armoring (3ft)	0	0.1	0.1	0.2	0.6
Reactive armored cap (3ft)	0.8	1	1	1.4	1.4
Dredge with backfill	0	1.3	1.3	1.5	2.8
Dredge with engineered cap (3ft)	0	0	0	0.5	1.1
Dredge with reactive armored cap (3ft)	2	2.4	3.6	5.2	5.4
Dredge with reactive cap (3ft)	0.6	0.8	1	1.8	2.5
Dredge with residual layer (1ft)	0	0	0	0.3	0.3
Dredge with reactive residual layer (1ft)	1	1.4	2	2.6	2.6
Dredge with reactive residual layer (1ft)	5.5	6.9	7.8	7.3	7.5
augmented reactive cap (3ft)	0.8	0.9	1	1	1

Riverbank Backfill and Cap Volumes (CY)

Technology Name	Alt. B	Alt. D	Alt. E	Alt. F	Alt. G
Backfill - 3 ft Dredge Volume minus 1ft Cap Volume					
Dredge with backfill	-	4,074	4,074	4,834	8,771
Dredge with residual layer (1ft)	-	-	-	840	840
Dredge with reactive residual layer (1ft)	3,207	4,315	6,449	8,090	8,096
Dredge with reactive residual layer (1ft)	17,603	22,069	24,886	23,495	24,194

Engineered Cap in Confined Areas					
Riverbank Area (AC)	-	-	-	0.5	1.1
Sand Layer (LCY)	0	0	0	807	1,775
Beachmix (LCY)	0	0	0	403	887

Armored Cap in Open Water Areas					
Riverbank Area (AC)	0.0	0.1	0.1	0.2	0.6
Sand Layer (LCY)	0	323	323	645	1,936
Armor (LCY)	0	161	161	323	968

Reactive Cap with Beachmix for Confined Areas					
Riverbank Area (AC)	0.6	0.8	1.0	1.8	2.5
Riverbank Reactive Layer (LCY)	968	1,291	1,613	2,904	4,033
Riverbank Carbon within Reactive Layer (TON)	48	64	80	143	199
Riverbank Sand within Reactive Layer (LCY)	36	48	60	109	151
Riverbank Sand Layer (LCY)	1,452	1,936	2,420	4,356	6,050
Beachmix (LCY)	484	645	807	1,452	2,017